3/3

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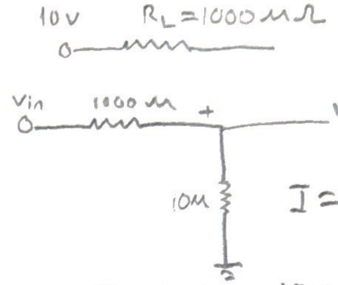
PHYS 251 HW 2

1.9, 1.10, 1.11

$R_V = 10\,M\Omega$
$R_L = 1000\,M\Omega$

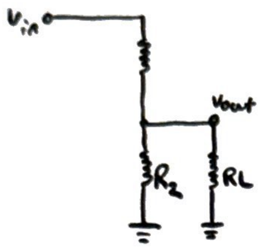


$I = \frac{10V}{1000 \times 10^6}$

$V = I \cdot 10M = \frac{10V \cdot 10 \cdot 10^6}{1000 \times 10^6} = .1V$

1.9 Since you can connect the resistor in series with the voltemeter, you create a ~~bigger~~ smaller resistance in the circuit thus making a ~~smaller~~ bigger current. If you wanted to measure the leakage resistance all you'd have to do is use $V = IR$.

1.10



$V_{in} = 30V$
$R_1 = 10K$
$R_2 = 10K$

$V_0 = \frac{V_1 R_2}{R_1 + R_2}$
$SCI = V_1 / R_1$
$V_T = \frac{V_1 R_2}{R_1 + R_2}$
$R_T = \frac{R_1 R_2}{R_1 + R_2}$

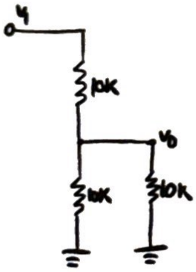
a.) V_0? $V_1 = 30V$, $R_1 = 10K$, $R_2 = 10K$

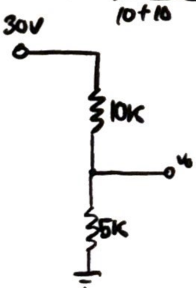
$V_0 = \frac{30V(10K)}{20K} = \frac{300}{20} = 15V$

$V_0 = 15V$

b.) 10K load

$10K \parallel 10K = \frac{10(10)}{10+10} = \frac{100}{20} = 5K$

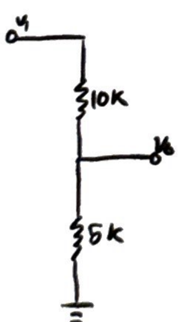




$V_0 = \frac{30V(5K)}{5K + 10K} = \frac{150KV}{15K} = 10V$

With load attached $V_0 = 10V$

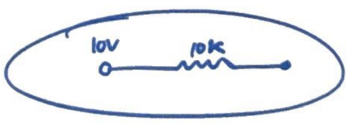
c.) Thevenin



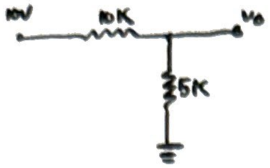
$R_T = \frac{R_1 R_2}{R_1 + R_2} = \frac{5K(10K)}{5K + 10K} = 10K$

$V_T = \frac{V_1 R_2}{R_1 + R_2} = \frac{30V(5K)}{10K + 5K} = 10V$

Thevenin Equivalent.



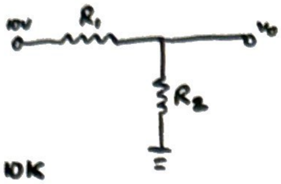
d.)



$$V_0 = \frac{V_1(R_2)}{R_1+R_2} = \frac{10V(5K)}{10K+5K} = \frac{150KV}{15K} = 10V$$

$$V_0 = 10V$$

e.)



$R_1 = 10K$
$R_2 = 5K$
$I = 1A$

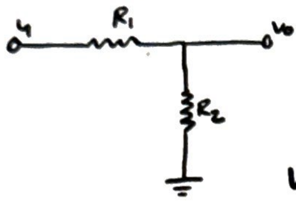
$P?$ $\quad P = R \cdot I^2$

$P_1: \; P = 10K\Omega(1A)^2 = 10W$

$P_2: \; P = 5K\Omega(1A)^2 = 5W$

$P_1 = 10W$
$P_2 = 5W$

1.11 Proposed Circuit



$R_1 = R_2 : \; \frac{2(2)}{2+2} = \frac{4}{4} = 1$

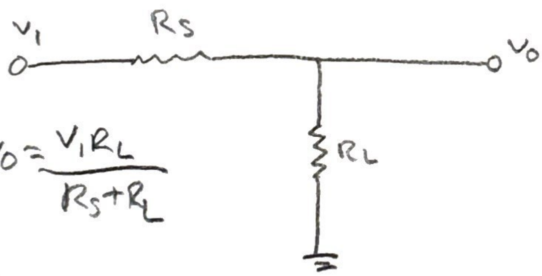
$R_1 \neq R_2 : \; \frac{2(1)}{2+1} = \frac{2}{3} = \frac{2}{3}$

$P = V^2/R$, $P = IV$, $P = I^2R$

$$V = \frac{10V(5K)}{5K+20K} = 2K \qquad V = \frac{10V(5K)}{5K+5K} = 5K$$

when $R_L = R_S$, there is a higher output voltage indicating the power will be greater due to the resistances being the same with a greater voltage.

$$P = V^2/R$$



$$P = \frac{V_0^2}{R_L} \qquad V_0 = \frac{V_1 R_L}{R_S + R_L}$$

$$P = \frac{V_1^2 R_1^2}{R_L(R_S+R_L)^2}$$

$\frac{dP}{dR_L} \rightarrow$ set $= 0$